

NAMBE 2003 Preliminary Program

Monday, September 29, 2003

8:10-10:10: Quantum Structures I

Chair: Norman Cheng (University of Illinois)

MA-1: Enhancement of one dimensionality by stacking effect of self-organized In_{0.53}Ga_{0.47}As quantum wires grown on (221)B-oriented InP substrates by MBE

S. Shimomura, K. Hyodo, A. Shigenobu, Y. Ohno, T. Kitada, and S. Hiyamizu
Osaka University, Japan

MA-2: Temperature Stabilized 1.55 μm Photoluminescence in InAs Quantum-Dots grown on InP

Z. H. Zhang and K. Y. Cheng
University of Illinois at Urbana-Champaign

MA-3: Improvement on the InAs quantum dot size distribution by employing high temperature GaAs(100) substrate treatments

N. Saucedo-Zeni, A. Yu. Gorbatchev, A. Lastras-Martinez, and V.H. Méndez-Garcia
Universidad Autonoma de San Luis Potosi, Mexico

MA-4: Extending the Emission of InAs/GaAs Self-Assembled Quantum Dots Beyond 1.3 μm Using Capping Effects

B. J. Riel, P. J. Poole, Z. R. Wasilewski, and S. Raymond
National Research Council-Canada

MA-5: Study of Structural and Optical Properties of Quantum Dots-in-a-Well Heterostructures

P. Rotella, G. von Winckel, S. Raghavan, A. Stintz, and S. Krishna
University of New Mexico

MA-6: Heterostructures for Achieving Very Large Responsivity in InAs/GaAs Quantum Dot Infrared Photodetectors

S. Chakrabarti^{a)}, A.D. Stiff-Roberts^{a)}, P. Bhattacharya^{a)}, and S. Kennerly^{b)}
^{a)}University of Michigan; ^{b)}Army Research Laboratory

10:30-12:10: Gallium Nitride-Based Growth and Devices

Chair: Shane Johnson (Arizona State University)

MB-1: Periodically Poled GaN Grown by Molecular Beam Epitaxy

Hock M. Ng, Nils G. Weimann, Manish Bhardwaj, and Aref Chowdhury
Bell Laboratories, Lucent Technologies

MB-2: The Effect of Ga-rich Growth Conditions on the Optical Properties of GaN Films Grown by Plasma-assisted Molecular Beam Epitaxy

A.V. Sampath, G. A. Garrett, C. J. Collins, P. Boyd, J. Y. Choe, P. G. Newman, H. Shen, M. Wraback, and R.J. Molnar*
U.S. Army Research Laboratory; *MIT Lincoln Laboratory

MB-3: Efficient p-type doping of GaN films by MBE

A. Bhattacharyya, W. Li, C. Thomidis, T. D. Moustakas, and David J. Smith*
Boston University; * Arizona State University

MB-4: Lateral photocurrent spectroscopy investigation of excitonic absorption in AlGaN/GaN multiple quantum wells grown by molecular beam epitaxy

I. Friel, C. Thomidis, Y. Fedyunin, and T. D. Moustakas
Boston University

MB-5: Polarization-doped 3D electron slabs in graded III-V Nitride heterostructures: MBE growth, physics, and demonstration of the PolFET

D. Jena, S. Heikman, D. Buttari, A. Jimenez, S. Rajan, H. Xing, J. S. Speck, and U. K. Mishra
University of California, Santa Barbara

NAMBE 2003 Preliminary Program

1:30-3:30: Quantum Structures II

Chair: Archie Holmes (University of Texas at Austin)

MC-1: Photoluminescence properties of CdSe quantum dots grown on ZnSe and $Zn_{0.97}Be_{0.03}Se$ by Molecular Beam Epitaxy

Xuecong Zhou¹, Martin Muñoz¹, Shiping Guo¹, Maria C. Tamargo¹, Yi Gu², Igor L. Kuskovsky², and G. F. Neumark²

¹The City College of New York; ²Columbia University

MC-2: Free carrier compensation of semi-metallic ErAs particles embedded in an InGaAs matrix

Daniel C. Driscoll^a, Micah P. Hanson^a, Mihail Suhkotin^b, Elliott Brown^b, and Arthur C. Gossard^a
^aUniversity of California, Santa Barbara; ^bUniversity of California, Los Angeles

MC-3: Growth and electrical properties of GaSb/ErSb composites

M. H. Hanson, D.C. Driscoll, J. Zimmerman, and A.C. Gossard
University of California, Santa Barbara

MC-4: The Selective Growth of InP Nanowires by Chemical Beam Epitaxy

P.J. Poole, J. Lefebvre, and J. Fraser
National Research Council-Canada

MC-5: Photoconductive characteristics in a trench-type InGaAs quantum wire

K.-Y.Jang^{1,2,3}, T.Sugaya^{1,2}, A.Shinoda^{2,4}, C.-K. Hahn^{1,2}, M. Ogura^{1,2}, and K. Komori^{1,2}

¹National Institute of Advanced Industrial Science and Technology(AIST); ²CREST, Japan Science and Technology Corporation (JST); ³Japan Science for the Promotion of Science (JSPS)-Domestic Research Fellow; ⁴Shibaura Institute of Technology, Japan

MC-6: Si-based Quantum Dot LED grown by MBE

M. Jo¹, N. Yasuhara¹, K. Kawamoto¹, and S. Fukatsu^{1,2}

¹The University of Tokyo, Japan; ²PRESTO, Japan Science and Technology Corporation (JST), Japan

NAMBE 2003 Preliminary Program

Poster Session 1: Monday, September 29, 2003, 3:30-500

P1-1: Magneto-Photoconductive Characterization of Quantum States of Barrier Shallow Donors in MBE Grown GaAs/AlGaAs Heterostructures

A. Naweed, W. D. Goodhue, W. J. Gorveatt, R. Giles, J. Waldman and V. Menon#
University of Massachusetts Lowell; # Princeton University

P1-2: Probing the Electronic Structures of III-V-Nitride Semiconductors by X-ray Photoelectron Spectroscopy

T.S. Lay¹, W.T. Kuo¹, L.P. Chen¹, Y.H. Lai², W.H. Hung², J.S. Wang³, J.Y. Chi³, D.K. Shih⁴, H.H. Lin⁴, C.M. Chuang⁵, K.H. Chen⁵

¹National Sun Yat-Sen University; ²National Synchrotron Radiation Research Center,Taiwan;

³Industrial Technology Research Institute,Taiwan; ⁴National Taiwan University; ⁵Institute of Atomic and Molecular Sciences, Academia Sinica

P1-3: Mg segregation in Mg-GaN MBE growth: A Simulation Investigation

Irena Stanley and Rama Venkat
University of Nevada, Las Vegas

P1-4: Epitaxial Growth on Gas Cluster Ion Beam Processed GaSb Substrates Using Molecular Beam Epitaxy

K. Krishnaswami^a, W.D. Goodhue^a, L.P. Allen^b, C. Santeufemio^b, X. Liu^c, M.C. Ospina^c, B. Zhu^a, J. Whitten^c, C. Sung^c, H. Dauplaise^d, D. Bliss^d, G. Dallas^e, D. Bakken^e, and K.S. Jones^f

^a Photonics Center, University of Massachusetts, Lowell; ^b Epion Corporation; ^c Center for Advanced Material, University of Massachusetts; ^d Air Force Research Laboratory/SNHC; ^e Galaxy Compound Semiconductors; ^f Department of Materials Science, University

P1-5: Optical and electrical characteristics of C60/GaAs

Masaaki Ogawa, Kazuki Nomoto, Yousuke Kida and Yoshiji Horikoshi
Waseda University, Japan

P1-6: Strong Lateral Confinement in Self-Organized InGaAs/InAlAs quantum wires grown on a (221)A oriented InGaAs ternary alloy substrate by MBE

K. Miyagawa, D. Suma, T. Kitada, S. Shimomura and S. Hiyamizu
Osaka University, Japan

P1-7: Stability of Pseudomorphic InGaAs Layers during annealing

A. Ripozan, G.K.M. Martin, and J. Mirecki Millunchick
University of Michigan

P1-8: Contact-less Electroreflectance of CdSe/ZnSe Quantum Dots grown by MBE

Martín Muñoz, Shiping Guo, Xuecong Zhou, Maria C. Tamargo, Y.S Huang#, C. Trallero-Giner*, and A. H. Rodríguez*
City College of the City University of New York; # National Taiwan University of Science and Technology; * Universidad de La Habana San Lazaro y L, Cuba

P1-9: MBE growth of ZnO using initial Zn layer and MgO buffer layer on Si (111) substrates

Miki Fujita, Noriaki Kawamoto, Masanori Sasajima and Yoshiji Horikoshi
Waseda University, Japan

P1-10: Compositional Analysis of Graded Al_xGa_(-x)As Layers by X-ray Energy Dispersive Spectrometry

K. Mahalingam, R. Wheeler, K. G. Eyink, and S. T. Fenstermaker
Air Force Research Laboratory

P1-11: Low Temperature Si Growth on Si (001): Impurity Incorporation and Limiting Thickness for Epitaxy

J.-M. Baribeau, X. Wu, D.J. Lockwood, L. Tay, and G. I. Sproule
National Research Council-Canada

NAMBE 2003 Preliminary Program

Tuesday, September 30, 2003

8:00-10:00: Special Topics in MBE Growth and Characterization

Chair: Hock Ng (Lucent)

TA-1: Studies of Oxide Desorption from GaAs Substrates via Ga_2O_3 to Ga_2O Conversion by Exposure to Ga Flux

Z. R. Wasilewski, J.-M. Baribeau, M. Beaulieu, X. Wu, G. I. Sproule, and J. W. Fraser
National Research Council-Canada

TA-2: Mn and Be co-doped GaAs for high hole concentration by LT-MEE

Koji Onomitsu, Hideo Fukui, Takashi Maeda, and Yoshiji Horikoshi
Waseda University, Japan

TA-3: Sb-Mediated Growth of Si and Be Doped AlGaAs by Molecular Beam Epitaxy

S. R. Johnson*, Yu. G. Sadofyev, K. Franzreb, Y. Cao, D. Ding, N. Samal, S. A. Chaparro, J. Wang,
J. Xu, S. Q. Yu, and Y.-H. Zhang
Arizona State University

TA-4: Composition Verification of AlGaAs Epitaxial Layers using Inductively Coupled Plasma Optical-Emission Spectroscopy

K. A. Bertness, T. E. Harvey, A. J. Paul, L. H. Robins, G. C. Turk, T. A. Butler, and M. L. Salit
National Institute of Standards and Technology

TA-5: Single-phase growth studies of GaP on Si by solid-source MBE

X. Yu, P.S. Kuo, K Ma, M. M. Fejer, and J. S. Harris Jr.
Stanford University

TA-6: Intermixing and As Incorporation in GaAs/GaSb Multilayers

C. Dorin, C. Wauchope, and J. Mirecki Millunchick
University of Michigan

10:20-12:00: Highly-Strained Materials: Growth and Characterization

Chair: Rod Beresford (Brown University)

TB-1: Dislocation Structure and Surface Roughness of InAs/As graded buffer layers grown on InP for 6.05 and 6.0 angstrom applications

A.M. Noori*, R.S. Sandhu*,§, S.L. Hayashi*,§, E.D. Meserole*, A. Cavus§, C. Monier§, R.Hsing§,
D. Sawdai§, M. Wojtowicz§, T. R. Block§, A. Gutierrez-Aitken§, and M.S. Goorsky*
*University of California, Los Angeles; §Northrop Grumman Space Technology

TB-2: Real-time strain evolution during growth of InAlAs/GaAs metamorphic buffer layers

C. Lynch, R. Beresford, and E. Chason
Brown University

TB-3: Effect of Buffer Layer on InSb Quantum Wells Grown on GaAs (001) Substrates

T.D. Mishima, J.C. Keay, N. Goel, M.A. Ball, S.J. Chung, M.B. Johnson, and M.B. Santos
University of Oklahoma

TB-4: Defect-Controlled Selective Epitaxial Growth of GaAs on Si substrate with Strained Short Period Superlattices

Takuto Tsuji, Hiroo Yonezu#, and Naoki Ohshima*
Takuma National College of Technology; #Toyohashi University of Technology; *Yamaguchi University

TB-5: Material Properties and Performance of Metamorphic Optoelectronic Integrated Circuits Grown by Molecular Beam Epitaxy on GaAs Substrates

W. Hoke, R. Leoni, C. Whelan, T. Kennedy, A. Torabi, P. Marsh, Y. Zhang, C. Xu*, and K.C. Hsieh*
Raytheon RF Components; *University of Illinois

NAMBE 2003 Preliminary Program

1:30-3:10: Materials for Spintronics and Quantum Information

Chair: Gary Wicks (University of Rochester)

TC-1: MBE growth of high Curie temperature GaMnAs films

R P Campion, K W Edmonds, L Zhao, K Wang, B L Gallagher, and C T Foxon
University of Nottingham, United Kingdom

TC-2: Influence of Defects on Structural and Magnetic Properties of GaMnAs

J. Sadowski^{1,2,3}, J. Kanski⁴, P. Svedlindh⁵, V. Stanciu⁵, J. Z. Domagala³, J. Bak -Misiuk³, A. Mikkelsen², C. Glover⁶, and E. Hankiewicz⁷

¹Copenhagen University, Denmark; ² Lund University, Sweden; ³Polish Academy of Sciences, Poland; ⁴Chalmers University of Technology, Sweden; ⁵Uppsala University, Sweden; ⁶Australian National University, Australia; ⁷Iowa State University, USA

TC-3: Reduced interface reaction during the epitaxial Fe growth on InAs for high efficiency spin injection

Kanji Yoh¹, Hiroshi Ohno¹, Kazuhisa Sueoka¹, and Manfred E. Ramsteiner²

¹Hokkaido University, Japan; ²Paul Drude Institute of Solid State Electronics, Germany

TC-4: Epitaxial Growth of a Spin-Polarized Ferromagnetic Oxide on Silicon: EuO/Si (001)

D.G. Schlom¹, V. Vaithyanathan¹, J. Lettieri¹, S.B. Ogale², S.K. Eah³, J. Levy³, J. Stephens⁴, V. Sih⁴, and D.D. Awschalom⁴

¹Penn State University; ²University of Maryland; ³University of Pittsburgh; ⁴University of California, Santa Barbara

TC-5: Epitaxial growth of two-dimensional Al(111) films on Si(111) – applications in quantum computing

D. A. Hite, R. W. Simmonds, K. M. Lang, R. McDermott, J. M. Martinis, and D. P. Pappas
National Institute of Standards and Technology

NAMBE 2003 Preliminary Program

Poster Session 2: Tuesday, September 30, 2003, 3:30-500

P2-1: Integrated In-Situ Monitoring of MBE Processes

R. Hartmann, P. Chow, and T. Barnacle
SVT Associates

P2-2: Growth of Be-doped GaInP/GaAs HBTS by all Solid-source Multiwafer Production MBE

A. Wilk, M. Zaknoune, S. Godey, P. Gérard, S. Dhellemmes, C. Chaix, and F. Mollot
RIBER and IEMN

P2-3: High Material Quality of 830nm Laser device Grown by SSMBE for Printing Applications

I. C. Hernandez, G. K. Kuang, and M. McElhinney
Lasertel, Inc.

P2-4: Investigation of radiative and non-radiative centers in Al-doped ZnSe grown by molecular beam epitaxy

D. C. Oh^a, J. S. Song^b, J. H. Chang^c, T. Takai^a, F. Lu^d, T. Hanada^a, M. W. Cho^a, and T. Yao^a
^aTohoku University, Japan; ^bKorea Maritime University; ^cNeosemiTech Corp., Korea; ^dFudan University, China

P2-5: Flux Profile Modeling : Monte Carlo Simulation and Numerical Computation

Bharat Reddy Pemmireddy¹, Ramprasad Vijayagopal¹, Rama Venkat¹, Hwa Cheng², and Rich Bresnahan²
¹University of Nevada, Las Vegas; ²Applied Epi-Veeco

P2-6: Solid-Source Molecular Beam Epitaxy (SSMBE) growth of GaInNAs on InP substrate

Junxian Fu, Seth Bank, Mark Wistey, James S. Harris, Jr
. Stanford University

P2-7: Optimisation of SiGe/Si hetero-interface in GSMBE aided by RHEED intensity oscillations

X.B. Li and J. Zhang
Imperial College London, United Kingdom

P2-8: Molecular beam epitaxial growth of antimony compounds on indium-free GaSb substrates

J.B. Héroux, C. Pei and W. I. Wang
Columbia University

P2-9: Real-time Ion Count from Nitrogen Plasma Source

Mark A. Wistey, Seth R. Bank, Homan B. Yuen, Lynford L. Goddard, and James S. Harris
Stanford University

P2-10: Regrowth of Extrinsic Contacts for High-Speed InP-based HBT Devices

V. Gambin, D. Mensa, M. Lange, A. Cavus, D. Sawdai, T. Block, A. Gutierrez-Aitken, and A.Oki
Northrop Grumman Space Technology

P2-11: Optical Properties of Very Low Temperatures Grown Compound Semiconductor by MBE

K. L. Chang, J. H. Epple, K. Y. Cheng, and K. C. Hsieh
University of Illinois at Urbana-Champaign

NAMBE 2003 Preliminary Program

Wednesday, October 1, 2003

8:00-9:40: Dilute Nitrides

Chair: James Gupta (NRC)

WA-1: Influence of the N₂ background pressure on the incorporation of Arsenic during MBE growth of GaAs

T. Dieing and B.F. Usher
La Trobe University, Australia

WA-2: The effect of hydrogen on the formation of gallium vacancies in GaInNAs

A.J. Ptak, Sarah Kurtz, R.C. Reedy, W.K. Metzger, M.H. Weber*, and K.G. Lynn*
National Renewable Energy Laboratory; *Washington State University

WA-3: Similarities between GaInNP and GaInNAs grown on GaAs (001) substrates

Y. G. Hong, A. Nishikawa, and C. W. Tu
University of California, San Diego

WA-4: Temperature dependence of optical properties of GaInNAs quantum dots grown on GaAs (001)

A. Nishikawa, Y. G. Hong, and C. W. Tu
University of California, San Diego

WA-5: 1.3 micron single lateral mode lasers based on InAs QDs and InGaAsN quantum wells

A.R.Kovsh^{1,2}, D.A.Livshits^{1,2}, N.A.Maleev^{1,2}, A.E.Zhukov¹, V.M.Ustinov¹, J.S.Wang², R.S.Hsiao², G.Lin², J.Y.Chu², and N.N.Ledentsov³

¹Ioffe Physico-Technical Institute, Russia; ²Industrial Technology Research Institute, Taiwan;

³Technical University of Berlin, Germany

10:10-11:50: Devices and Device Structures I

Chair: Brian Bennett (NRL)

WB-1: High-Power Room-Temperature Continuous Operation of Molecular Beam Epitaxy grown Type-I In(Al)GaAsSb/GaSb diode lasers at 2.7 and 2.8 microns

J.G. Kim#, L. Shterengas*, R. Martinelli# G. Belenky*
#Sarnoff Corporation; *State University of New York at Stony Brook

WB-2: Correlation of Growth Conditions with Photoluminescence and Lasing Properties of Mid-IR Antimonide Type-II "W" Structures

C. L. Canedy, W. W. Bewley, C. S. Kim, M. Kim, I. Vurgaftman, and J. R. Meyer
Naval Research Laboratory

WB-3: MBE Growth of High Power 980 nm Pump Lasers Using In-situ and Ex-situ Monitoring for Production Control

W. Liu, A. Kussmaul, S. Deng, G. Yang, and S.C. Palmateer
Corning Lasertron

WB-4: MBE Growth of Quantum Cascade Lasers on GaAs (111)B Substrates for Second Harmonique Generation

X. Marcadet, V. Ortiz, J.-Y. Bengloan, M. Calligaro, Isabelle Maurin*, and Carlo Sirtori*
Thales Research & Technology, France; *Université Denis Diderot, France

WB-5: Polarization-Controlled lasing of a self-organized InGaAs quantum wire VCSEL grown on (775)B-oriented GaAs substrates by MBE

Y. Ohno^a, Y. Takasuka^{b,c}, M. Ogurac, K. Komori^c, S. Shimomura^a and S. Hiyamizu^a

^aOsaka University, Japan; ^bShibaura Institute of Technology, Japan; ^cNational Institute of Advanced Industrial Science and Technology, Japan

NAMBE 2003 Preliminary Program

1:30-3:10: Devices and Device Structures II

Chair: Dan Mars (Agilent)

WC-1: Comparison of As- and P-Based Metamorphic Buffers for High Performance InP HBT and HEMT Applications

D. Lubyshev, J. M. Fastenau, X.-M. Fang, Y. Wu, C. Doss, and W. K. Liu
IQE, Inc.

WC-2: Regrowth of InAlAs/InGaAs/InP DHBT Active Layers

V. Gambin, D. Mensa, M. Lange, A. Cavus, D. Sawdai, T. Block, A. Gutierrez-Aitken, and A. Oki
Northrop Grumman Space Technology

WC-3: Metamorphic 6.00 Å HBTs on InP by MBE

M. Lange, C. Monier, R. Sandhu, A. Cavus, T. Block, V. Gambin, D. Sawdai, and A. Gutierrez-Aitken
Northrop Grumman Space Technology

WC-4: Comparison AlInAs and InAsP Tunnel Barriers for Implementation in InAs-Based Bipolar Transistors

K. L. Averett¹ X. Wu², M. W. Koch², and G. W. Wicks²
¹Air Force Research Laboratory; ²University of Rochester

WC-5: MBE Growth of AlGaPSb/InP DBRs on InP

J. F. Klem¹, D. K. Serkland¹, J. Kim², and T.- Y. Wang²
¹Sandia National Laboratories; ²Honeywell International

End of Main Conference

NAMBE 2003 Preliminary Program

Thursday, October 2, 2003

Workshops are scheduled from 8:00-3:00, including a morning coffee break and lunch.

1. Production Aspects of Next-Generation MBE Materials

Chairman: Tom Block, Northrop Grumman (formerly TRW) (thomas.block@ngc.com)

This workshop will explore aspects of moving next-generation MBE materials into production. The format of the workshop will be presentations by experts in the different materials and group discussions. Each speaker will address the following topics in their presentation:

- Advantages of new materials over existing production technologies
- Applications and opportunities for new materials
- Significant growth-mechanics related challenges remaining
- Equipment improvements desirable for production

Specific topics and speakers are currently in development.

2. Long Wavelength Optoelectronics

Chairman: Yong-Hang Zhang, Arizona State University (yhzhang@asu.edu)

This workshop will focus on MBE growth of semiconductor materials for long wavelength (> 1μm) optoelectronic device applications. Material systems to be covered include III-V semiconductors and IV-VI compounds. The device applications will include long wavelength VCSELs, quantum cascade lasers, quantum dot lasers, and MWIR and LWIR lasers.

Preliminary List of Invited Speakers

"MBE growth of THz Quantum Cascade Lasers on GaAs," John Reno, Sandia National Lab.

"Growth of Antimonide-Based Interband Cascade Lasers on Gallium Arsenide Substrates," Cory J. Hill, Baohua Yang, and Rui Q. Yang, Jet Propulsion Laboratory, California Institute of Technology, "MBE growth of Mid-infrared IV-VI lead-salt QW VCSEL," Z. Shi, F. Zhao, A. Majumda, H. Z. Xu, X. Lu, L. Jayasinghe, S. Khosravani, V. Kelkar, R. Singh, D. Ray, University of Oklahoma.

3. MBE for Quantum Information

Co-chairmen: Richard Mirin, NIST (mirin@boulder.nist.gov)

Nitin Samarth, Penn State (nsamarth@psu.edu)

This workshop will focus on new materials and devices for Quantum Information. Materials such as dilute magnetic semiconductors and quantum dots will be discussed. Important topics of discussion will include what advances need to be made in MBE growth in order to advance the area of Quantum Information.

Preliminary List of Invited Speakers

Prof. Jeremy Levy, University of Pittsburgh

"Oxide-Semiconductor Materials for Quantum Computation"

Prof. Michael Flatté, University of Iowa

1. *An Introduction to Quantum Information Technologies: A Range From "You Can Buy It Now" to "Can It Ever Be Done?"*

2. *Molecular Beam Epitaxy Challenges from Quantum Information Technologies*

Dr. Tom Reinecke, Naval Research Laboratory

"Semiconductor Nanostructures for Quantum Information Technology"

Dr. David Pappas, National Institute of Standards and Technology

"Epitaxial materials for solid state quantum computing applications"